

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of : KAZUTO OKAMURA et al.

Serial Number : 10/534,249

Filed : 10 May, 2005

For : LAMINATE FOR HDD SUSPENSION  
WITH THE USE OF THIN COPPER FOIL  
AND METHOD FOR MANUFACTURING  
THE SAME

Group Art Unit : 1794

DECLARATION UNDER 37 CFR 1.132

Honorable Commissioner

Alexandria, Virginia 22313-1450

Sir:

Now comes Yuji Matsushita who declares and says that:

1. I am a co-worker of Kazuto Okamura who is an inventor of the United States Patent Application Serial Number 10/467,463. I am also one of the inventors of U.S. Patent No. 6,203,918 (Shimose et al).

2. I graduated from Kyushu University Faculty of Engineering synthetic chemistry department in 1993, and I subsequently graduated from Kyushu University graduate school engineering

postgraduate course in 1995.

3. I have been employed by Nippon Steel Chemical Co., Ltd. since 1995, and I studied the development of HDD suspension materials, the development of the de novo copper foil for the COF field of application, and the metallization technology (sputtering, plating) development to a polyimide film.

4. I have proved the feature which is different from the characteristics of a conductor shown by Shimose et al (U.S. Patent No. 6,203,918) quoted by the examination about conductor layer prescribed in the present invention.

#### PROOF

1. Re: Copper foil characteristics of EXAMPLE 1 of Shimose et al.

I obtained a product catalogue of electrolytic copper foil CF-T9 produced by Fukuda Metal Foil & Powder Co., Ltd.

The data (an extract) on the copper foil characteristics in the catalogue;

Official name thickness:  $9\mu\text{m}$

Tensile strength: 350MPa (at 23°C), 180MPa (at 180°C)

From the data in the catalogue, the electrolytic copper foil illustrated by EXAMPLE 1 of Shimose et al is the one where the

tensile strength reaches less than 400MPa.

2. Re: Copper foil characteristics of EXAMPLE 4 of Shimose et al.

I obtained a product catalogue of C7025 TM-03 produced by Olin Somers Corporation.

The data (an extract) of the copper foil characteristics in the catalogue;

Electrical Conductivity: 35% IACS Min. @68° F

From the data in the catalogue, the metal rolling copper foil illustrated by EXAMPLE4 of Shimose et al, is the one where the conductivity reaches less than 65%.

## Conclusions

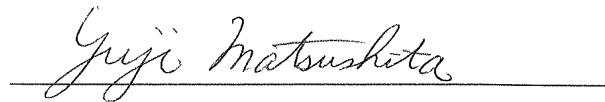
I can conclude as follows on the basis of the foregoing.

The copper foil of Shimose et al (U.S. Patent No. 6,203,918) is less than tensile strength 400MPa or conductivity 65%. Therefore, it has been confirmed that none of Shimose et al discloses a conductance layer satisfying the requirements of the present invention.

I, the undersigned petitioner, further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be

true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

This 10th day of July 2008

A handwritten signature in cursive script, reading "Yuji Matsushita", is written over a horizontal line.

Yuji Matsushita

Address : c/o Nippon Steel Chemical Co., Ltd.  
1- Tsukiji, Kisarazu, Chiba, 292-0835 Japan

Attachments:

Catalogue 1 : Catalogue of Fukuda Metal Foil & Powder Co.,  
Ltd.

Catalogue 2 : Catalogue of Olin Somers Corporation



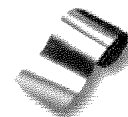
## 製品情報

**FUKUDA**  
 FUKUDA METAL FOIL & POWDER CO., LTD.

企業情報 | 事業内容 | 製品情報 | 財務情報 | 採用情報 | HOME

金属粉の製法 | 電解箔の製法 | 金属箔の製法 | 製品カタログ

## 銅箔代表特性 Representative copper foil characteristics



製品カタログトップへ戻る

## 電解銅箔 Electrodeposited Copper Foil

IPCグレード

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製品名 (CF) Product name (CF)	原箔 処理	SV	SV	HS	SV	HTE	HS	HTE
		T9系/T8系						
公称厚さ Official name thickness	μm	9	12			18		35
質量厚さ	g/m <sup>2</sup>	80	107	107	153	153	153	285
光沢面粗さ Ra		0.25	0.25	0.25	0.25	0.25	0.25	0.25
粗面粗さ Rz	μm	1.8	1.8	5.5	1.8	7.0	7.0	9.0
Tensile strength at 23°C		350	350	430	350	350	440	350
引張強さ	N/mm <sup>2</sup> (=MPa)	180	180	200	200	180	200	210
	at 180°C							
	at 23°C	8	8	7	10	10	10	16
伸び率	%	11	12	6	15	6	6	6
	at 180°C							
常態		0.65	0.80	1.15	0.95	1.50	1.45	1.95
はんだ処理後 S-4	kN/m	0.65	0.80	1.15	0.95	1.50	1.45	1.95
引き剥がし強さ		0.60	0.65	1.00	0.75	1.30	1.25	1.70
	高温時 at 125°C							
	煮沸処理後 D-2/100							
	HCl処理後	劣化率	< 20	< 20	< 20	< 20	< 20	< 20
	18% HCl 25°C 60min.	%	< 2	< 2	< 2	< 2	< 2	< 2

はんだ濡れ性 IPC-4562

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## 圧延銅箔 Rolled Copper Foil

IPCグレード

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製品名 (CF)	原箔 処理	RCF							
		T5B	T4X	T5B	T4X	T5B	T4X	T5B	T8
公称厚さ	μm	9		12		18		35	
質量厚さ	g/m <sup>2</sup>	82	76	107	100	158	152	305	305
光沢面粗さ Ra		0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
粗面粗さ Rz	μm	3.0	1.2	3.0	1.2	3.0	1.2	3.0	4.0
引張強さ	縦 (MD)	440	440	440	440	440	440	440	440
	横 (TD)	420	420	420	420	420	420	420	420
常態	伸び率	%	1.2	1.2	1.7	1.7	2.0	2.0	2.0
	横 (TD)	%	1.0	1.0	1.5	1.5	1.5	1.5	1.5
耐折力 *	縦 (MD)	回	2000	2000	1200	1200	1000	1000	300
(MIT)	横 (TD)	回	1000	1000	350	350	200	200	50
引張強さ	縦 (MD)	N/mm <sup>2</sup>	190	190	210	210	220	220	220
	横 (TD)	N/mm <sup>2</sup>	170	170	180	180	200	200	200
アニール後	伸び率	%	5	4	13	13	17	17	20
(180°C-1hr.)	横 (TD)	%	5	4	8	8	12	12	17
耐折力 *	縦 (MD)	回	300	300	280	280	230	230	200
(MIT)	横 (TD)	回	200	200	180	180	150	150	140
引き剥がし強さ	常態	kN/m	0.60	0.50	0.60	0.50	0.75	0.70	1.05
(FR-4)	はんだ後 S-4	kN/m	0.60	0.50	0.60	0.50	0.75	0.70	1.05

はんだ濡れ性 IPC-4562

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\* 耐折力 (MIT) 荷重500g 曲率半径0.8mm 試験片幅15mm

**C7025****Table 2**

Alloy C7025 Mechanical Properties							
Temper Name	Tensile Strength		Yield Strength		Elongation % in 2" (51mm)	Approximate Hardness	
	ksi	kgf/mm	ksi	kgf/mm		Rockwell 15T	Rockwell 30T
TM00	90-110	63-77	65-90	45-63	10% Min.	83-89	73-79
TM02	95-120	67-84	85-110	59-77	7% Min.	86-92	75-81
TM02 Special	96-121	67-86	85-110	60-77	7% Min.	86-92	75-81
TM03	100-125	70-88	95-120	66-84	5% Min.	89-95	77-83
TH03	70-90	49-63	65-85	46-60	5% Min.	83-86	73-77
TR02 *	88 Min.	62 Min.	80 Min.	56 Min.	6% Min.	87-93	76-82
TR04	115-131	81-92	109-123	77-86	1% Min.	---	---
* For leadframe applications only							

**Table 3**

Alloy C7025 Physical Properties		
Physical Properties	English Units	Metric Units
Melting Point (Liquidus)	2003° F	1095° C
Melting Point (Solidus)	1967° F	1075° C
Density	.318 lbs/cu in @ 68° F	8.82 gm/cu cm @ 20° C
Thermal Conductivity	85-110 Btu ft/sq ft hr ° F @ 68° F	0.35-0.45 cal cm/sq cm sec ° C @ 20° C
Electrical Resistivity (Annealed)	25.9 ohms (cir mil/ft)	4.3 microhm-cm @ 20° C
Electrical Conductivity - TR02	40% IACS * Min. @ 68° F	0.23 megmho/cm @ 20° C
TR04	30% IACS * Min. @ 68° F	0.17 megmho/cm @ 20° C
TM00	40% IACS * Min. @ 68° F	0.23 megmho/cm @ 20° C
TM02	40% IACS * Min. @ 68° F	0.23 megmho/cm @ 20° C
TM02 Special	40% IACS * Min @ 68° F	0.23 megmho/cm @ 20° C
TM03	35% IACS * Min. @ 68° F	0.20 megmho/cm @ 20° C
TH03	50% IACS * Nom. @ 68° F	0.29 megmho/cm @ 20° C
Modulus of Elasticity	19,000,000 psi	13,500 kg/sq mm
* International Annealed Copper Standard		

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